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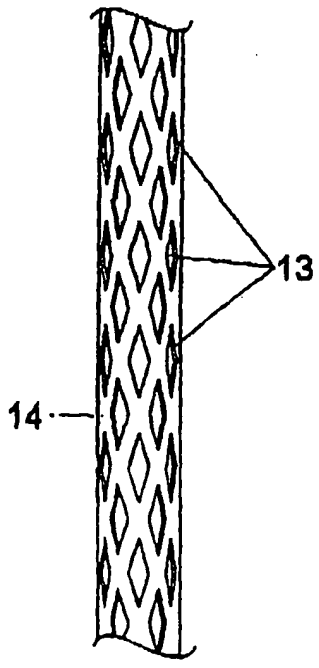
(54) Title: TUBULAR GOLF CLUB SHAFT



(57) **Abstract:** A tubular golf club shaft generally a tubular metal shaft (1, 3, 10, 13, 16, 19), is provided in which the wall of the shaft has a series of deformations (2, 4, 7, 9, 15, 18) or apertures (11, 13) in its wall extending over at least a part of its length. The deformations or apertures are adapted to increase at least one of the flexibility and shock absorbency of that part of the length of the shaft.

WO 01/39847 A1

TUBULAR GOLF CLUB SHAFT

FIELD OF THE INVENTION

This invention relates to tubular golf club shafts and, more particularly, to various configurations of tubular golf club shafts which will improve one or more of their flexibility, shock absorbency, and vibration damping when compared to conventional tubular shafts.

BACKGROUND TO THE INVENTION

It is generally accepted that the distance which a person can hit a golf ball is, at least to some extent, dependent on the flexibility of the shaft of the relevant golf club. As a result of this, fibre reinforced synthetic resin golf club shafts have gained considerable popularity in recent years as a consequence of the fact that they are generally more flexible than tubular metal shafts and, in addition, the flexibility of a fibre reinforced golf club shaft is capable of being tailored more easily to fulfill requirements perceived to be advantageous.

However, fibre reinforced synthetic resin golf club shafts are, generally speaking, appreciably more expensive than tubular metal shafts. In particular, the cost of such shafts is dictated to a considerable extent by the type of fibre that is used to reinforce the synthetic resin. Some extremely sophisticated fibres are available but, unfortunately, these fibres usually lead to the golf club shafts being considerably more expensive than conventional tubular shafts.

OBJECT OF THE INVENTION

It is an object of this invention to provide a golf club shaft of a tubular nature and wherein the shaft is configured so that the flexibility, shock absorbency, or both is increased with respect to a conventional tubular shaft.

SUMMARY OF THE INVENTION

In accordance with this invention there is provided a tubular golf club shaft in which the wall of the shaft is provided with a series of deformations or apertures extending over at least a part of its length and wherein the deformations or apertures are adapted to increase at least one of the flexibility and shock absorbency of that part of the length of the shaft.

The deformations may be a series of grooves extending in a generally circumferential direction around the shaft, either internally or externally, and optionally connected one with the other to form a continuous helical groove or alternatively extending circumferentially at spaced positions along the length of that part of the shaft. The grooves may be defined by changes in wall thickness of the tubular shaft wall in which case either the inner or the outer surface as the case may be will generally be substantially smooth or, alternatively, the grooves may be formed by deforming the entire wall thickness of the shaft to define the grooves in which case complementary ridges will be formed on the inner surface of the shaft.

In another arrangement of the invention grooves extend longitudinally along the length of the shaft.

The deformations could also be a series of indentations other than grooves and arranged very much in the manner of the apertures defined below but wherein a thinner wall section replaces each of the apertures.

As an alternative to grooves the wall of the tubular shaft may be provided with a series apertures through the wall at a series of positions spaced apart along the length of said part of the shaft. The apertures could assume any appropriate shape such as circular but will generally be elongate and arranged in a pattern designed to provide the required flexibility of the shaft. The apertures may be covered either internally and/or externally with a sleeve or film of material rendering the apertures impermeable.

The series of deformations or apertures may extend over only a part of the length of the shaft or over the whole length.

In order that the invention may be more fully understood various embodiments thereof will now be described with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:-

Figure 1 is an elevation of a golf club having a shaft with a helical groove in the outer surface thereof according to the invention;

Figure 2 is a similar view but wherein the shaft of the golf club has a series of circumferential grooves spaced apart along the length thereof;

Figure 3 is a sectional elevation of the part of the length of the golf club shaft illustrated in Fig 2;

Figure 4 is a sectional elevation similar to Figure 3 but showing a variation in which the grooves are on the inside of the tubular shaft instead of the outside;

Figure 5 is a similar sectional elevation of an alternative arrangement of grooves on the golf club shaft;

Figures 6 and 7 are each an elevation of a part of the length of two further embodiments of the invention;

Figure 8 is a similar view of a still further arrangement of grooves on the outside of a golf club shaft;

Figure 9 is a cross-section taken through the shaft illustrated in Figure 8; and,

Figure 10 is a view similar to Figure 9 but illustrating a variation of the embodiment of Figures 8 and 9 in which the grooves are on the inside of the tubular shaft.

DETAILED DESCRIPTION WITH REFERENCE TO THE DRAWINGS

In the embodiment of the invention illustrated in Figure 1 a golf club shaft, generally indicated by numeral (1), has a continuous helical groove (2) formed in its outer surface and extending along its length. In the case of the embodiment of the invention illustrated in Figure 2 the golf club shaft, generally indicated by numeral (3), has a series of spaced circumferential grooves (4) extending along its length.

In each case, the groove or grooves (2 or 4) is formed by machining out

portion of the thickn ss of the wall (5) or pressing the wall or swaging it so that the wall thickness varies along the length of the shaft as shown clearly in Figure 3. The inner surface (6) thus remains smooth and continuous in these embodiments of the invention. It is to be noted that the invention will generally be applied to metal shafts in order to achieve an advantageous price structure. However, the invention is equally applicable to tubular shafts made of any other suitable materials.

A variation of the arrangement described above is that the grooves (7) could be on the inside surface with the outer surface (8) being smooth, as illustrated in Figure 4.

In the embodiment of the invention illustrated in Figure 5, a similar effect is achieved but in this case by pressing the entire thickness of the side wall inwardly to provide grooves (9) appearing, on the outside, to be similar to those illustrated in Figure 3, but in which the entire wall thickness, in sectional elevation passes through a sinuous curve with the wall thickness remaining substantially constant.

In each of the embodiments of the invention described above the formation of the grooves will increase the flexibility and shock absorbency of the shaft. The series of convolutions of the grooves may extend along the entire length of the shaft, as illustrated in Figures 1 and 2, or may, alternatively, be provided along only a selected portion of the length of the shaft. By selecting a particular portion of the shaft, the position of flexing during the playing of a golf stroke can be varied and thus the shaft can be tailored to fulfill certain requirements. Also the degree of flexibility can be varied by varying the depth of the grooves as well as the wall thickness of the golf club shaft.

Turning now to the embodiment of the invention illustrat d in Figure 6, a golf club shaft (10) has a series of apertures (11), in this case elongate apertures, formed through its wall. These apertures will also have the effect

of increasing the flexibility of the tubular shaft and the number and size of the apertures as well as the wall thickness will dictate the flexibility of the shaft. The shape of the apertures may be varied widely and they could thus be circular which may assist from a manufacturing point of view. Also, the apertures could be covered with an outer or inner sleeve or film of impervious material to close the apertures for aerodynamic purposes or to prevent the build-up of dirt internally. An external sleeve of this nature is indicated by numeral (12) in Figure 6. As indicated above the series can extend along the entire length of the golf club shaft or along only a part of its length in exactly the same way as is described in respect of the grooves.

Figure 7 illustrates a still further embodiment of the invention in which apertures (13) are formed through a tubular golf club shaft (14) but in this case the apertures are of elongate diamond shape and arranged to form a lattice of shaft wall between adjacent apertures as illustrated. Such a lattice can also be formed using apertures of other shapes.

As a further alternative to apertures, and in particular apertures closed with a sleeve or film, the shaft wall may be provided with a series of indentations forming thinner wall sections. These indentations could be arranged similarly to the apertures described above.

Figures 8 and 9 illustrate an embodiment of the invention in which grooves (15) extend longitudinally along the length of a tubular golf club shaft (16) so that the wall thickness varies around the circumference, as illustrated clearly in Figure 9, and what are effectively ridges (17) are formed to extend along the relevant part of the length of a golf club shaft.

Figure 10 illustrates a variation of this embodiment in which the longitudinally extending grooves (18) ar formed on th inside surface of the tubular shaft (19) thereby providing a smooth outer surface (20) to the shaft .

Num rous other arrangements are possible within the scope of this invention without departing from the scope hereof. Thus, apertur s of any suitable shape are intended to be included within the scope of the invention as are any grooves other than those described above. Also, the material of manufacture of the shaft is not limited in any way to metal shafts provided that the shafts are tubular and have a wall thickness varied or perforated to provide a series of apertures.

CLAIMS:-

1. A tubular golf club shaft in which the wall of the shaft (1,3,10,13,16,19) is provided with a series of deformations (2,4,7,9,15,18) or apertures (11,13) extending over at least a part of its length and wherein the deformations or apertures are adapted to increase at least one of the flexibility and shock absorbency of that part of the length of the shaft.

2. A tubular golf club shaft as claimed in claim 1 in which the shaft has a series of deformations in the form of grooves (2,4,9) extending in a generally circumferential direction around the shaft, either internally or externally.

3. A tubular golf club shaft as claimed in claim 2 in which the grooves (2) are connected one with the other to form a continuous helical groove.

4. A tubular golf club shaft as claimed in claim 2 in which the grooves (4) extend circumferentially at spaced positions along the length of that part of the shaft.

5. A tubular golf club shaft as claimed in any one of claims 2 to 4 in which the grooves are defined by changes in wall thickness of the tubular shaft wall with one of the inner (6) or the outer (8) surface being generally substantially smooth.

6. A tubular golf club shaft as claimed in any one of claims 2 to 4 in which the grooves (9) are formed by deforming the entire wall thickness of the shaft to define the grooves in which case complementary ridges are formed on the inner surface of the shaft.

7. A tubular golf club shaft as claimed in claim 1 in which the shaft has a

s ries of deformations in the form of grooves (15,18) extending longitudinally along the length of the shaft on the inside or outside surface thereof.

8. A tubular golf club shaft as claimed in claim 1 in which the shaft has a series of deformations in the form of indentations other than grooves defining a series of thinner wall sections.

9. A tubular golf club shaft as claimed in claim 1 in which the shaft has a series of apertures through the wall at a series of positions spaced apart along the length of said part of the shaft.

10. A tubular golf club shaft as claimed in claim 9 in which the apertures are arranged in a pattern designed to provide the required flexibility of the shaft.

11. A tubular golf club shaft as claimed in either one of claims 9 or 10 in which the apertures (13) are arranged in a pattern designed to form a lattice type of configuration to the tube wall.

12. A tubular golf club shaft as claimed in any one of claims 9 to 11 in which the apertures are covered either internally and/or externally with a sleeve or film of material (12) rendering the apertures impermeable.

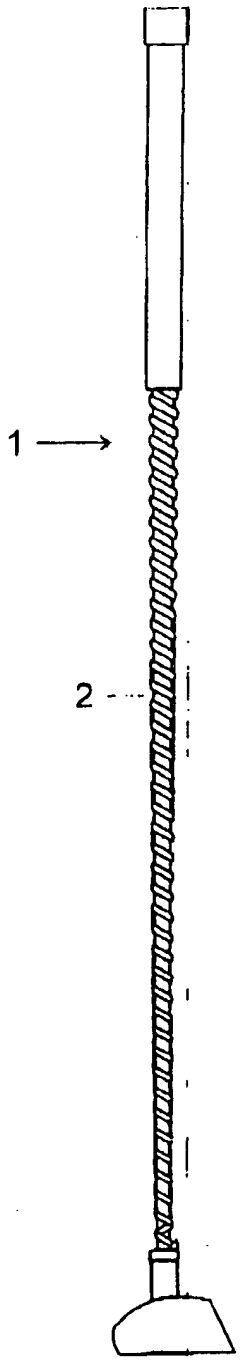


FIG 1

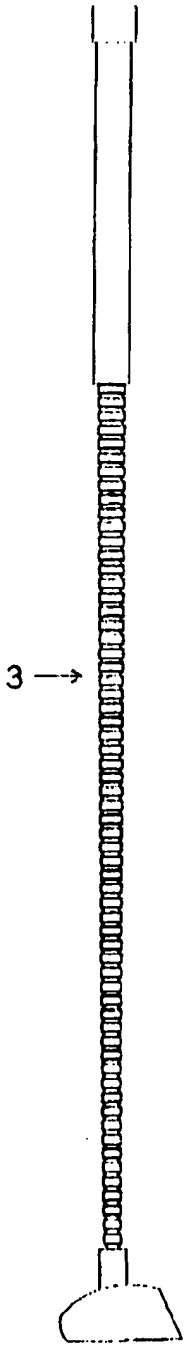


FIG 2

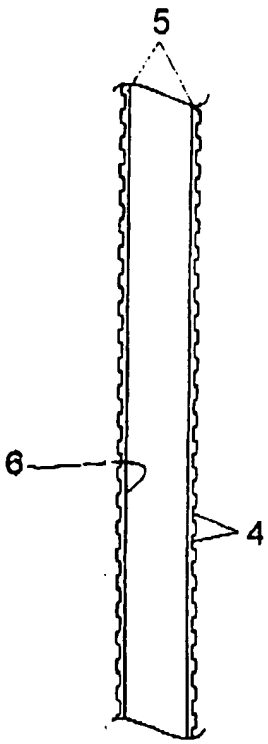


FIG 3

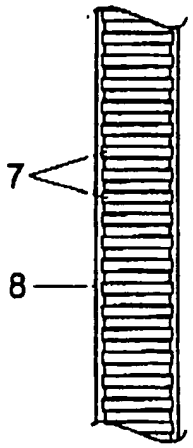


FIG 4

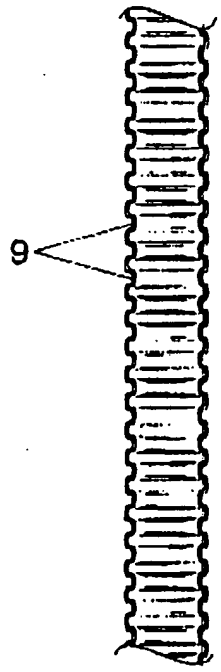


FIG 5

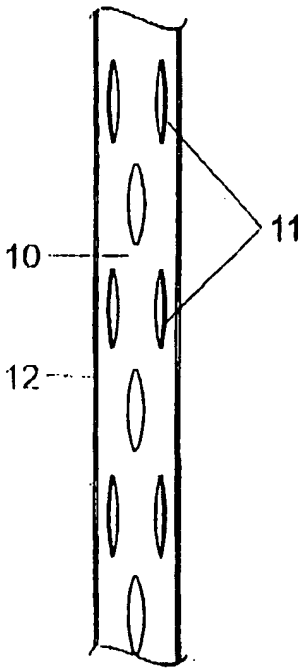


FIG 6

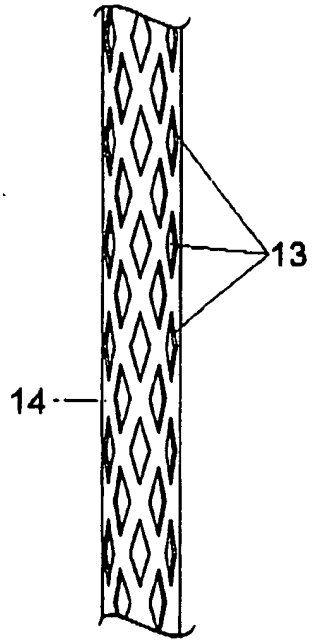


FIG 7

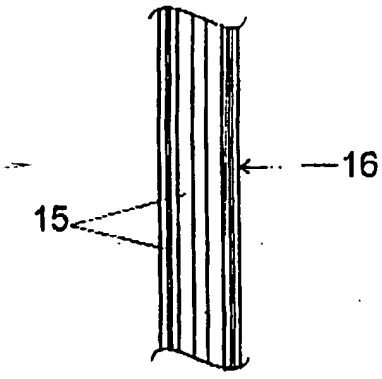


FIG 8

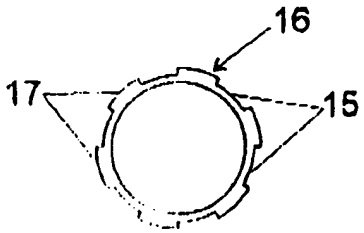


FIG 9

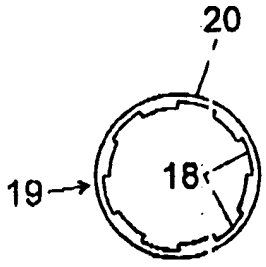


FIG 10

INTERNATIONAL SEARCH REPORT

Int. tional Application No
PCT/ZA 00/00238

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A63B53/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A63B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 106 777 A (KIM SUNG BAIK) 15 August 1978 (1978-08-15) column 3, line 63 -column 4, line 19; figures 1,1A,2A	1-8
X	US 5 904 628 A (MACKAY JR JACK W ET AL) 18 May 1999 (1999-05-18) abstract; figures 12-14	1-6
X	GB 256 049 A (THOMAS POLLOCK JUNIOR) 5 August 1928 (1928-08-05) figures 1-4	1-6
X	GB 385 241 A (ARTHUR HAROLD STEVENS) 22 December 1932 (1932-12-22)	1-5,8
A	the whole document	6

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
23 March 2001	30/03/2001

Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

Inte .ional Application No
PCT/ZA 00/00238

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
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A	the whole document	6
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A	page 2, line 89 - line 111; figures 4-6	5,6
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A	abstract; figures 2-4	5,6

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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